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# THE DISCOVERY OF TIME

## V

### The Egyptian Calendar

WE have seen, in our general survey, how the reckoning of time reflects everywhere the outlook and habits of society, as these in turn reflect the environment and conditions of life of early peoples. In no other country is this more evident than in ancient Egypt. There it was almost inevitable that the solar year should triumph, for the land itself forced along the adjustment. Nowhere else does nature provide such a chronometer as in the valley of the Nile. The long, rock-bound river basin, like a vast but narrow-throated water-glass, holds and slowly passes along the periodic floods. There was no such instrument as this at hand for the farmers of Bœotia or Italy to measure by. For four out of twelve months the water-glass fills and empties, leaving an interval of only eight months which it requires no great ingenuity to divide into two seasons of four months each, the first being that of the growth of the crops and the second rounding out the easy symmetry of the year.[1] For the flood returns at such regular periods that it is possible for even fairly simple people to calculate against the time of its coming,—especially since the interval is not too long. Moreover, by a strange coincidence, priestly observers, watching the heavens at the critical time when the flood was due, could see the bright dog-star, Sirius, just rising then at dawn. This "heliacal rising" of the star, so strangely fitting in with the coming of the flood, furnished, therefore, a genuine date for a New Year,—and the river itself swelling out before one's eyes, announced the fact to the whole country. The coming and going of moons—while still a matter of some importance—was bound to be subordinated to such a system, where the major gods of a religion, the constant stars and the demands of business all fitted into a common

[1] For details on the three seasons, *Cf.* Ginzel, I., page 159. On the artificial character of the four-month season of harvest, see Foucart in Hastings's *Encyclopædia of Religion and Ethics*, article "Calendar." The Egyptian farmer's calendar was, from the peculiar conditions of the Nile life, a complete variation from that indicated above as the basis of European farming calendars.

scheme. Moons would do for reckoning time in Babylonia, where the floods of the Euphrates were less exact, and less important. But in Egypt, where the whole country was a clock, how could one miss the time?

Yet that is just what the Egyptians did! They never reckoned the time correctly. Three hundred and sixty-five days do not make a solar year, but only a rough guess at one; they are over six hours short. However, the Egyptians let it go at that and held to their venerable error through all the long centuries of their history. It was not until the year 238 B.C. that the simple device of a leap-year of 366 days once every four years was decreed, in order to keep the civil year in correspondence with the stars.[2] But even this was not obeyed nor followed up, and it was left for Augustus to end the age-long blunder by imposing upon Egypt that revised calendar of 365¼ days which Julius had himself received from an Egyptian astronomer.[3]

Although Egyptologists are all agreed that the Egyptian year was thus inaccurate, they are by no means united upon what was done by the Egyptians to make such an inadequate calendar work. It is claimed by one group of Egyptologists that nothing was done to check the error, that the short calendar year went on for centuries, gaining days and years over the solar year without any one ever bothering over it. This is as flatly denied by other scholars, basing their argument upon both inscriptions and probabilities. It is a controversy in which only the trained Egyptologists have the right to speak; although even they have hardly the right to speak with dogmatic assurance. For the mere existence of such divergent views shows upon how slight grounds some of them must rest.

The foremost exponents of the former view are Eduard Meyer in Germany and J. H. Breasted in America, both illustrious names in the science of Egyptology. According to them the calendar year, running ahead a little over one day in four years, had gained a whole year in 1460 ($4 \times 365$) years, without priests or pharaohs intervening to stop the process. The gain was very slow, almost imperceptible, only a week in a generation, or about a month in a lifetime,—too little to bother about. Any reform would disturb business and religion even more than the retention of the old misleading cycle.

[2] The Decree of Canopus, under Ptolemy III., Euergetes, dated its reform from the 7th of March, 238 B.C. The inscription was found in 1866. German translation in Ginzel, "Handbuch," Vol. I., page 197.

[3] The exact date of the introduction of the Julian year in Egypt—known as the Alexandrine era—is a matter of dispute. For discussion see Ginzel, "Handbuch," Vol. I., pages 224–228, who inclined to the view that the first leap-year was 26 B.C., but that the epoch was carried back to 30 B.C. E. Meyer, "Geschichte des Altertums," Vol. I., page 29, dates it from the twenty-ninth of August, 25 B.C.

Hence, they claim, the Egyptian year revolved through the solar once in every 1,460-year period. A text in Censorinus, the astronomical writer of the days of the Antonines,[4] states that the opening of the calendar year coincided with the heliacal rising of Sirius in the year 139 A.D.; *i. e.*, that in that year the star rose at sunrise on the old first day of the Egyptian year, our 19th of July. With this as a starting point our historians reckon back "Sothic cycles"[5] of 1,460 years to 1321, 2781 and 4241 B.C., on which years the star Sirius rose at dawn on the 19th of July. This leads to the statement that in the year 4241 B.C. the calendar year of 365 days was inaugurated, since 1,460 years before that date would be too early and 1,460 later would be too late.[6] If this theory could be accepted, then, we have an exact date, and one of the oldest in the world, for the beginning of an astronomical measure of time. Unfortunately, there seems to be little to support it. There is no mention of the "Sothic cycle" until late in the Roman period. The ancient monuments are silent upon it. So the first obvious conclusion seems to be that it was a creation of the late astronomers, calculating backwards in the way just indicated, and that it never existed as a matter of history at all. In fact, when it is used for chronology its critics claim that it leads to some impossible dates and direct contradictions with some of the monuments.[7] These facts, combined with the silence of Herodotus, seem to the critics of the Meyer hypothesis sufficient ground for consigning the "Sothic cycle" to the realm of historical myth. And yet when the critics come to offer the alternative hypothesis, *i. e.*, that the year was lengthened from time to time to bring the festivals' stars together, the data in the texts are just as lacking. Moreover, the Decree of Canopus assures us that in 239 B.C. the calendar year was 10 months out, and as the reform of that decree was not carried out we see how the short year was apparently allowed to go on completing its cycle then.

It is unnecessary here to follow further the details of a controversy which still divides Egyptologists and can only be settled by the discovery of new data. But it is important for us to realize how either hypothesis detracts from the achievement of the ancient Egyptians, as set forth in some enthusiastic histories. Either they rested content with a revolving year which corresponded with nothing in nature,

[4] *De die natali*, c. 18; written 239 A.D.

[5] *Sothic* from *Sothis* the Hellenized form of *Sopdu*, the Egyptian name for Sirius.

[6] Cf. Ed. Meyer, "Aegyptische Chronologie" in *Abhandlungen der Berliner Akademie der Wissenschaften*, 1904, 1907, and his "Geschichte des Altertums," Vol. I., page 30. Breasted, "Ancient Records," Vol. I., pages 25, *et seq.*

[7] *Cf.* summary by G. Foucart, in article "Calendar" (Egyptian) in Hastings's *Encyclopædia of Religion and Ethics*, page 95.

except once in almost 1,500 years or they intercalated days at odd intervals, without the regularity necessary for accurate records of time. The year of 360 days with 5 extra ones thrown in was apparently in use in Egypt long before the fifth millennium; but the science of Egypt never, until the close of its history, and then under foreign auspices, broke loose from the bonds of its own forging. It left the field of astronomy and accurate chronology for the Greeks in Alexandria to discover in a later era.[8]

## VI

### The Babylonian Calendar

From Egypt we turn to Babylon—known almost from the dawn of history as the mother of astronomy. But again we find that what has passed the careless scrutiny of most historians for scientific achievement is a poor and disappointing thing. Contrary to common belief, ancient Babylon and Assyria contributed almost nothing to any real science of astronomy until almost the close of Assyrian history. This fact, which is now established by ample evidence from the inscriptions, is one of the most important in the intellectual history of mankind. It shows again with clear and crushing force what lasting barriers superstition can erect on the road toward science.

The earliest chapter of Babylonian—or, more correctly, Sumerian—history reveals the common outlook of any semi-savage people, sunk in that crude animism which fills the world with supernatural powers. Every living or moving thing had its *zi*, or spirit, every uncanny spot was haunted by the ghost-demon, *lil*, and fetish cults and magic rites extended the imagery of fear. Over and above this low grade superstition there was a worship of local and tribal divinities and of those mysterious forces of nature which are to be found in every pantheon of advancing cultures.

We can not attempt here to disentangle the complicated mythol-

[8] Ginzel, Vol. I., page 152, points out the relatively slight progress made in astronomy by the ancient Egyptians. They knew the Zodiak, the most important constellations; they had distinguished planets from the fixed stars, had observed the heliacal rising of Sirius, etc.; and yet the results of their observations were very crude. The monuments do not show whether they knew the relations between the movements of the planets or not. The development of astrology in Egypt came in its later period. There is nothing in the sources on the observation of eclipses,—the very thing which furnished the Babylonians with the means for determining the movements of sun and moon. Ptolemy, the great astronomer, had to turn to Babylonian and Greek forerunners, apparently, in view of the lack of Egyptian material. In any case, in the material found so far, there is absolutely no trace of that systematic activity in the taking of observations, without which no certain progress can be made in astronomical science.

ogy, in which these divinities interfuse and interwork. How, for instance, Ea, the god of Eridu, the city on the gulf, was as well the god of water, or Enlil, of Nippur, the god of the underworld and the life-giving earth remained a sort of second personality for Marduk,[9] the great god of fertile Babylon, and how these two formed with the sky god, Anu, of the city Erech, the Sumerian triad, to be invoked together for so many centuries. A new situation was created, however, when—still long before the great days of Babylon—the Semites swept in upon Sumeria, bringing with them, so it seems, that devotion to the supreme moon-god, Sin, and developing that accompanying worship of the sun, Shamash, and of Venus (Ishtar) of which the records now yield increasing evidence.[10] At first this triad differs in no way from the other. It was undoubtedly just part and parcel of the great pre-religion of luck, muddled in with the luxuriant beliefs of animism, an extension, if anything, of primitive superstitions. Nevertheless it contained—as we see it now—the possibilities of a new intellectual outlook. The haphazard, unaccountable world, where spirits and demons and all the fantastic embodiments of the uncanny might cut athwart the natural movement of cause and effect, could in future be organized into a pattern of vast and regular form,—could, that is, if the priests would merely watch the movements of their deities. In the normal run of things it would seem that, when religion fastened the hopes and fears of men to the stars, a science of astronomy would inevitably follow, that the attention bestowed upon Powers at once supreme and visible, would result in definite and careful observation and a body of knowledge of lasting value. But such was not the case. The pattern of the universe was not accurately mapped out, the motion of the stars was not correctly calculated until thousands of years after the moon-god began his reign in Babylon. Fetishism, magic, incantation, rites of sacrifice and augury maintained their hold. If religion directed attention to the clock of the universe, it also drew across its face the veil of mystery and diverted the observer by its fantastic myths, so that even astrology made little progress until the closing period of Assyrian-Babylonian history. Egypt reveals the benumbing influence of custom and habit; Babylon the blight of credulity. Social convention in the one and relig-

[9] Marduk absorbed the powers of Enlil just as later the Hebrews attributed to their Jahve powers which the Babylonians had attributed to Marduk. *Cf.* R. W. Rogers, "Religion of Babylonia and Assyria," page 134.

[10] Sin had been as well the local deity of the city of Ur, and Shamash of Larsa and Sippar, but the gods share the fortunes of their worshippers, and apparently it was the Semite conquest which was responsible for the dominance of the moon over the affairs of Babylonia.

ion in the other barred for many centuries the path of scientific inquiry.

Yet the work of the priests of Babylonia was destined, in a strange and tortuous way, to furnish the basis for the scientific advance. For untold ages they applied themselves to the futile task of mastering the data of luck, by observing portents and recording omens. Libraries were filled with tablets preserving the directions for charms in magic and the rules for taking the auspices. In the same way they noted the stars that "presided" over crises in life and interpreted their coincidences in terms of that universal law of similarity which, as we have seen, so largely explains the world to the primitive. The blood-red planet Mars (Ninib) would somehow coincide with something in the story of war; Ishtar (Venus) would somehow be connected with the story of love. The connection might seem, to any chance doubter, had there been one, often far-fetched and distorted, but the codification of all this mass of conflicting material fell to the hands of men highly gifted in the art of codifying. The code of Hammurabi, that oldest systematic and comprehensive body of law in the world's history, the discovery and publication of which thrilled with surprise even the blasé dawn of our twentieth century, was but one of many such compilations in Babylonia. The task of codification was forced upon the inhabitants of a country of shifting races and empires, of continual intercourse through commerce with the outside world, if the heritage of the past were to be made to fit with the contributions of the present; and the priests of Mesopotamia met the task nobly, in the spirit of scholarship. The libraries of the Assyrians bear witness to an activity such as that which codified the Roman law or harmonized the theology of the Middle Ages.[11] Had

[11] Codification involves a historical operation in its discriminating analysis and careful synthesis, whenever it deals with data of social evolution. There is a sense in which the code of the Roman law would fit very well with the conception of history in antiquity, particularly that expounded by Polybius. In it the experience of the past is teaching the inexperienced present; it is a preservation of those elements of the past which can apply to the complications of other times. The rest may be discarded; what is kept is the useful, the real fruit of all past activity. But the more historical the codifier is, the less his work is likely to be of value. For when the sense of the past is strong—as is surely to be the case in all religious compilations, owing to the sacredness of origins—the result is a failure to meet the changed conditions of the present. The result is stagnation. Boldness in the intellectual quest is sacrificed in order to secure results which harmonize with those already attained, and no matter what wealth and variety of phenomena the present offers, what chances of intellectual and social advance it opens up, the mind or the society which is bound to the wheel of antique premises or authority revolves, but does not progress. It is from this angle that one comes upon that antagonism between antiquarian scholarship and radicalism which has been so marked in the last two centuries.

a science of luck been possible, the long and careful labors of the Babylonians surely would have discovered it. As it was, the study of the conditions in the universe under which things happened, in order to learn the forces of luck involved in them, would seem at least to have held the promise of eventual discovery of the conditions in and for themselves, and so instead of a science of luck there would have been a science of nature. It was a promise, however, which the Babylonians themselves never really fulfilled. They furnished the basis for the scientific advance, but were never able to win sufficient emancipation from the primitive superstitions to make the advance themselves. They did succeed, finally, in the seventh, sixth, and fifth centuries B.C. in supplanting the crude old myths by a mathematical statement of the movements of the stars.[12] But astrology, the last phase of Babylonian priestly lore, was still rather a religion than a science. Its calculations and observations were, as in the earlier cults, for the purpose of discovering the properties of the stars, and the very numbers in which the astral movements were reckoned were the mystical embodiments of fate. It was reserved for another and more gifted people to transform astrology into astronomy; and even the Greeks were not quite emancipated from the age-long curse of the religion of luck.

The main reason why this mass of priestly lore was not more useful for science, was, as has just been hinted, the weakness of its mathematics. And this was due in turn—apart from the eternal stumbling block of the mystery and sacredness of numbers, of the luck embodied in the sixes, sevens, and their multiples, and all the persistent jumble of accompanying superstitions,—to the lack of an accurate base of reckoning. The first essential for the study of re-

[12] The achievements of the ancient Babylonians in astronomy have been much over-stated by a group of scholars, of whom the chief is Hugo Winckler—the pan-Babylonians—whose main tendency has been to trace everything back to the early age of Babylon. The recent works of Strassmaier and Kugler, based upon the deciphering of Assyrian astrological tables, have quite disproved this proud claim of extreme antiquity for Babylonian astral science. Edward Meyer ("Geschichte des Altertums," page 458) points out the striking fact that Orion seems to have been unknown to the ancient Babylonians, while it appears in the oldest periods of Egyptian history, along with Sirius, and plays a great rôle in the hieroglyphs. It was also known very early to the Greeks (*cf.* Hesiod as above). The same is true of the Great Bear. From dim antiquity the Babylonians had known the movements of Venus—the brilliant star which rose on winter mornings and set on summer evenings, and already in the twentieth century B.C. they had measured its heliacal cycle of 21 years (from 1977–1957 B.C. See Kugler on Table 63). They also easily distinguished the four other planets of that group which, as we have seen, gave us the names for the days of the week; Ninib (Mars), Nibo (Mercury), Marduk (Jupiter), and Nergal (Saturn). Eclipses were also kept track of, but not with sufficient accuracy to yield any scientific results until in the late Babylonian period.

curring phenomena of the heavens is a reliable measurement of the intervals at which they recur, and this, in turn, is impossible so long as time is measured by the moon.

We have seen how the moon-god gained ascendency in Babylon in the days of the first Semitic kingdom. Dominating the religion, it dominated the cosmology. In the earliest semitic records, Sin, the moon-god is so lofty a deity that the sun-god, Shamash, is referred to as his "sevitor."[13] The "victorious sun" won his supreme place in Mesopotamia only in later ages, and not until the Semite had yielded before the Aryan Prussians was his triumph assured. So long as the Semites ruled, the moon blocked both his path and that of a rational cosmology. Why this was so—that Babylon should cling so persistently to the moon, when Egypt so many centuries earlier turned to the sun as the center of its cosmology—is not a fact to be explained away on any easygoing materialistic basis. But, on the other hand, the materialist data need not be neglected, and a little consideration shows us that although nature was perhaps more kindly to Babylonia than to Egypt in the fertility of farms, it was, by this very fact, less propitious in the arrangement of the seasons. Pliny tells us how wheat grew there twice a year,[14] which would disorganize any farmer's calendar that was trying to follow the sun. Under such circumstances, we can see how the invading Semites, coming from the desert where they had imbibed so deeply the nomad feeling for the moon, would not be obliged, when settling on the soil, to lay aside that deep-seated, primitive sense of its dominating luck over the nights and days, for another calendar run by the sun. Whatever the reason,[15] the moon ruled in Babylon, and the calendar bore the marks of it.

We shall leave aside the question of the exact way in which the Babylonian calendar grew up.[16] It is a matter concerning which Assyriologists are still not agreed, and new inscriptions may at any

[13] *Cf.* M. Jastrow, "Babylonian and Assyrian Religion," pages 68 ff. It is interesting to note that the name, "Sin," occurs in "Sinai," showing some definite south-Arabian affiliations. The early custom of reckoning the day from the evening is of interest in this connection. Later, the Assyrians began it at daybreak. Compare the North American Indian's reckoning by so many "nights" or "sleeps."

[14] "Natural History," Vol. XVIII., page 17.

[15] The greater ease of observing the moon with the naked eye as compared with the sun is also a factor.

[16] The exact origins of the Babylonian calendar are as obscure as those of the Egyptian. The hypothesis of an original year of 360 days with 5¼ added, which was advanced by H. Winckler and those of the "old Babylonian school," has, apparently, no data in its favor. Every city seems to have had a different calendar at first, and the unification to have come only very slowly, after the first dynasty of Babylon. *Cf.* Ed. Meyer, "Geschichte d. Altertums," pages 365 ff.

day recast the story in a different setting. But, whatever primitive measures of time they started with—different in different cities—the priests of Babylonia had their lunar calendar in operation as long ago as 2500 B.C. The month, which began with the first appearance of the new moon in the evening sky, was reckoned with fair exactness as 29½ days,[17] but as this was an impossible measure, two lengths of months were employed, 29 days for a "hollow" month and 30 days for a "full" month. In the early calendars it was, therefore, customary and necessary to indicate along with the name of a month what number of days it contained. Twelve of these months made a year of 354 days. As this was over eleven days short of the solar year, the next calendar year would be quite out of reckoning with the sun, the seasons, and such festivals as they involved. As this kept getting worse instead of better, an additional month had to be intercalated—making the year 384 days—at the command of the priests, whenever they decided that the festivals needed readjustment. The priests seem to have worked out no unchanging system of intercalation until the close of Babylonian history, when in the Persian period regularity was definitely assured.[18] The query comes to even the superficial student whether the "victorious sun" of the Persian heavens was not in some way responsible for this rectification.

So far, the survey of the ancient Babylonian history has been disappointing. But a new era began in the seventh and sixth centuries B.C., in which the age-long groping of the priests, their uncertain dating and ineffective observations were changed into accurate and scientific calculations. This was one of the most important events in all the world's history, one of the major epochs in the history of intellectual emancipation, perhaps hardly less decisive than the age of Copernicus and of Newton. For to it we can trace the first accurate orientations of mankind in time and of the world in space. To it go back all lines of scientific advance in chronology and astronomy. The story of this achievement, however, carries us from the consideration of calendars to that of chronology, from the reckoning of time by days to that of years and then of non-recurring periods. In the chapters which follow we have, therefore, the setting for the dawn of history.

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(*To be continued.*)

[17] The length of the astronomical month, it may be recalled, was 29.530589 days.

[18] *Cf.* Ginzel's "Handbuch," Vol. I., pages 132 ff., for lists of the years of intercalation.

## A THING AND ITS PROPERTIES

THE examination of space and time must have convinced the reader that philosophy can set the categories in their true light only when it studies them genetically. To introduce a view which belongs to one level into another level can only work confusion. It will be our purpose to apply this method to the study of the distinction between a thing and its properties. What does common sense mean by a thing and what does it mean by properties? Does science hold to the same meanings or has it changed them fundamentally? Let us investigate these questions in the endeavor to decide what view philosophy must defend.

Empirical substances or things are believed by common sense to be the direct objects of perception. To the unsophisticated mind, they are as they are perceived and are held to be open to the inspection of all men with their five senses. This attitude with its various assumptions has already been studied by us and we have agreed to call it natural realism. The trees which grow in my neighbor's yard are instinctively regarded by me as real things, things which I must reckon with, which have taken many years to attain their present size and have nourished themselves by their roots and leaves during that time. The things which I perceive are independent of the sensations which they cause in me and are also quite oblivious to any concepts I may form with respect to them. A deal of hard experience has gone into the making of this attitude; the independence and indifference of things has been borne in upon man as a result of the labor he has undergone in trying to make the world more adapted to himself. Now these meanings must be accepted and they spell some sort of realism. What we wish to do is to examine the outlook attached to these meanings in common sense and to show how untenable it is in many respects.

Things, for common sense, are perceived or at least capable of being perceived and are known to be independent of the perceiver so long as he does not operate upon them by means of his body. They are also known to occupy space, to be in relations of a spatial kind with the other things, to be, more or less stable and perdurable, and to possess qualities or properties of various sorts. All this is common knowledge. The classificatory sciences extend our knowledge of things within this framework and thus add greatly to our information concerning the number of things and what obvious properties they have. As a result, these things fall into natural groups such as the inorganic and the organic and these larger groups split up into smaller ones. So far as possible such classifications try to be "real"

or to follow the important properties of the things rather than "artificial" and to wait upon our convenience. Philosophy has little if anything to say as regards such empirical investigations and resultant classifications.

Common sense has no definite theory of what it means by the independence and realness of things. If asked to define its attitude and assumptions, it is at first at a loss to conceive what the question can mean; it seems to it foolish even to ask the question. Of course things are out there; they are as real as my body; I must adapt myself to them; they are a part of nature; I see them. Things are certainly not our experiences, they are as real as we are and as independent of us as we are of other persons. The pressure of human experience lies back of this attitude and in our theory of knowledge we have seen reason to accept it as essentially true. The generalizations of science have likewise but confirmed it. Astronomy, geology, physics, evolutionary biology have piled fact upon fact and theory upon theory, all pointing to the reality of nature and to the belief that we are but insignificant and temporary parts of it.

Things are, then, experienced as in the same world with ourselves; it is they to which we must adapt ourselves and we must use them in various ways in order to maintain ourselves. Through centuries of conscious and unconscious reasoning, certain distinctions have been drawn and certain meanings have developed, and the realness and independence of things is one of these basic distinctions. Their realness is bound up with their empirical independence; they confront us at every move and compel our recognition and our adjustment. In short, they seem to be as immediately given and as real as ourselves. Here, again, we see the truth of the assertion that our categories are, in the main, products of unconscious thinking, of unreflective distinctions forced upon us by experience.

This genetic approach gives us our clue. Perceptual experience and practical thinking precede theory, with the result that the category of thinghood is found ready to hand when reflection arises. Things are as real as are enemies and food and shelter. The attitude which goes with the perception of things is thus as old as organic life itself. The centuries of evolution but gave it content and a wider setting. Natural realism and the category of thinghood are, in fact, inseparable.

The delimitation of things in the world to which we react was, so far as we can make out, the function of personal interests guided by perception. Man was built on a scale that enabled him to include a wide field in a single survey and to be interested in the outlines of molar bodies like trees and boulders and animals. Since many of these objects moved in a total fashion, they were included as a unity

in the span of attention. The background of nature had as a foreground a large number of "things," which stood out from one another for various concrete reasons and which could each awaken a vital interest to give grip to its power of stimulating the sense-organs. When we examine our experience and the interests which run quivering through it, we are unable to think of any other possible development. Perceptual and empirical space are both filled with a manifold of objects which stand out from one another and from ourselves in the most natural way while yet concerned with one another. That which is given to adult reflection is very complex and the burden of proof rests with the skeptic to show that it is not essentially veracious.

But our present task is to trace the development of the idea of thinghood from its perceptual stage to the scientific level. What is naturally meant by things? What changes, if any, does science introduce into our natural view of things? How must a critical philosophy conceive things? These are the questions we are compelled to ask ourselves in our attempt to understand the framework of our knowledge of nature.

Things have qualities or properties, they are in spatial relations with one another and together compose nature, and they interact. To comprehend things we must, therefore, study them critically in regard to these aspects of our experience of them. It is evident that these aspects involve other categories such as relation and causality which must be taken up for detailed consideration later, but which are here seen to be naturally involved in the adequate conception of *that which* is spatial and is capable of change. Thus, even in the naïve view of nature, we glimpse the essential unity or togetherness of the categories. Space, time, thing, property, relation, and causality, make themselves marked as essentially inseparable in our knowledge of the physical world. Science and philosophy are but more systematic extensions of this knowledge and more painstaking and thorough studies of these implicit categories. We shall seek to justify the belief of critical realism that this development and clarification can be carried through in a satisfactory fashion so that the *framework of knowledge* will fit its *content* and involve no self-contradiction. When this work is done, critical realism as a theory of knowledge will find its completion in critical realism as a metaphysics.

While bearing in mind the fact that spatial relations and causal interaction are inseparably bound up with our notion of things, we shall lay our main stress upon the distinction between things and their qualities or properties. The study of this distinction will put us on the track of what I may fairly call the internal categories, such as structure, arrangement, organization, activity, in contrast to the external categories such as relation, motion, causality.

Man experiences things as complex while yet somehow one. An apple, for instance, has a certain size, a certain shape, a certain odor, a definite taste when eaten, a fixed weight, etc. It is *one* apple and this one apple has various qualities which can be sensed at different times according to the sense-organ that is stimulated. In some way, then, we experience the apple as complex; we keep the same subject of reference while we note quality after quality. It is this double fact of oneness and complexity together which has given rise to the philosophical problem of substance and inherent properties. Let us try to analyze the experience a little more closely to see whether it rightly falls into this customary, philosophical framework. It may be that we have here a typical *pseudo*-problem which, if not guarded against, will lead the unwary into a conceptual labyrinth from which there is no escape. It is my own firm conviction that the whole historical movement from Locke to Hume is but a *reductio ad absurdum* of this customary framework. Berkeley and Hume disproved the existence of substance as implied in this contrast, but, nevertheless, did not, for all their ingenuity, disprove the existence of a physical world of which we can gain valid knowledge. As we shall see, they only proved that Locke's realism was untenable. They did not realize that it was Locke's implicit view of knowledge reflecting the prejudices of natural realism that was at fault. Just how we shall interpret the complexity in unity of things is, therefore, a crucial point.

The distinction between a thing and its qualities is made naturally and inevitably. This pencil which I take up and examine is regarded by me as real and independent of my attention; I note its color and say that it is yellow, its length and say that it is quite short, the quality of its lead and say that it is soft. These judgments, in other words, are all made within the context of natural realism. They imply the category of thinghood and work within that outlook. In short, the world which I perceive breaks up into portions which act together and force me to recognize them as somehow one, to be treated as one and thought of as one, in the same general sense that I myself am one. These things are spatial, their parts hang together, they move as one, and so on. It is evident that their unity is for us both spatial and functional and the recognition of this unity is present in the category of thinghood as an essential element.

But these things are complex; I can note various aspects and pass judgments in which the thing is the given and accredited subject, a subject which natural realism regards as present to the mind. The assignment of attributes is thus an analysis of what is given as a sort of implicit whole. We note *that* this thing is of a certain color, *that* it is so large, etc. There is nothing mysterious in this process of judgment. The manifoldness of our judgments does not in any way

militate against the unity of that about which we are judging. Otherwise analysis would involve a contradiction.

Suppose, then, that, working within the framework of natural realism, our analysis has become complete, that we have passed a large number of judgments of which the thing is the subject. If our position is correct, these judgments do not make the thing disappear, but enrich it. The thing is *known as* all these things, as yellow, as of a certain length, etc. And this fact gives us our clue. The tendency to regard the thing as something distinct from its properties is the expression of a false logic which common sense could hardly understand. The thing is neither the sum of its properties nor something apart from them. The trouble with philosophy is that it has not been empirical enough; it has substituted associational psychology for actual experience. The thing is decidedly not given as a cluster of sensations, but as a thing of complex character *about which* we can make various judgments. When this empirical situation is once realized, it becomes obvious that the various judgments do not pretend to give "parts" of the thing out of which the thing can be composed. The thing is yellow and the thing is of a certain length; but the thing is not thereby proclaimed to be the sum of length and a yellow color. I, for one, resolutely deny that we have the right to interpret judgments of an attributive kind in this mechanical fashion, and I believe that any temptation to do so arises from a false sophistication due to the confusion of the standpoint of associational psychology with that of logic.

I can bring out my meaning by using Locke as my horrible example. This procedure will serve a double purpose since it will introduce us to the traditional category of substance in the proper way. From our standpoint, it should be noted that Locke does not realize the artificiality of his point of view; he does not see that analytic judgment works within a preceding organization of experience and meanings. To understand natural realism does not involve its acceptance, but philosophy, if it is to state our problems correctly, must commence with descriptive empiricism. Just because Locke does not do this, he is at a loss to account for the unity that so evidently accompanies the qualities reduced by him to ideas. "The mind takes notice that a certain number of these simple ideas go constantly together; which *being presumed to belong to one thing* and words being suited to common apprehensions, and made use of for quick despatch, are called, so united in one subject, by one name; which, by inadvertency we are apt afterward to talk of and consider as one simple idea. . . ." Thus Locke reads the result of a conditioned analysis as a *real division* into parts, in this way mistaking the nature of logical analysis. When he is haunted by a residue,

something left out, after he has sought to measure the sum of the "ideas" to the thing, he calls this residue a substratum "because not imagining how these simple ideas can subsist by themselves, we accustom ourselves to suppose some substratum wherein they do subsist and from which they result; which, therefore, we call substance." When Locke is occupying the standpoint of the scientific realism of his day, he names his ideas, qualities, or accidents, and supposes them to exist outside the mind and to be supported in some mysterious fashion by a substance. The theory-of-knowledge difficulty he tries to meet by doubling his ideas which are his data into primary qualities in the mind and their archetypes in the substance.

Now, in opposition to Locke's psychological atomism, the standpoint of descriptive empiricism simply points out that these various judgments about a thing enrich our *knowledge of the thing* or, to put it as common sense experiences it, our *apprehension of the nature of the thing is* deepened by noting that the thing is yellow, of a certain length, hard in texture, etc. The distinction between a substance and its attributes does not exist for natural realism; it is the thing which is yellow and so on. Here, as elsewhere, philosophy has often distorted experience; it has been metaphysical in the bad sense; it has substituted a conceptual construction for the actual experience.

What must be our own position in regard to the sphere of existence of these empirical things which we regard ourselves as apprehending when we occupy the standpoint of natural realism? When we bring our own theory of knowledge to bear, we realize at once that these things are thing-experiences and exist only within experience. They are objects of apprehension within experience, objects which are enriched by analytic and synthetic judgments. There is in them no substratum; they are as they are experienced as. As regards things, we are at the perceptual level. Berkeley was perfectly right in his attack upon Locke's position and in his declaration that sensible things, things immediately perceived, exist only within experience. As a matter of fact, they exist only within each individual's experience and there are as many sensible things as there are percipients.

In order to drive this position home, let us glance at some of the *pseudo*-problems which have arisen from an ungenetic treatment. Common sense does not reflect enough to have theories; it has only attitudes and meanings. Therefore, we shall glance at some of the traditional theories built up around what I have called the conceptual construction substituted for actual experience.

Suppose the concrete thing of experience to be broken up into a substance and its attributes; what is the substance and how does it

possess its attributes? It is with this *pseudo*-problem that Berkeley made merry to the bewilderment of all future philosophers and the apparent establishment of idealism. Now Berkeley had little difficulty in proving that the Lockean type of substance is unthinkable. How can qualities inhere in something which is unknown and unknowable? Are not inherence and support mere metaphors taken from concrete experience which have no relevance since they can not be taken literally? So soon as we make qualities *entities* we are unable to understand how a substance can possess them. Surely substance has no legal property rights in qualities! So much for substance and for matter as such a substance. Berkeley is right in what he disproved, not in what he thought that he proved.

But many thinkers have fallen back upon the distinction between primary and secondary qualities as somehow an answer to the above problem. There is in this attempt, however, a misunderstanding which perverts a distinction which is significant when properly approached. In the first place, as we shall show later, there is a total misunderstanding of science. No matter what the unphilosophical scientist may think, the scientist is not dealing with perceptual aspects of things. He works at a different genetic level, a fact which our study of scientific space and time has made clear. In the second place, so long as we maintain allegiance to the Lockean construction, the insurmountable objections referred to above remain in full force. How does substance possess the primary qualities? If they are qualities, they can not exist alone, since they are metaphysical adjectives, not substantives. And these difficulties, when their implications are understood, are of themselves sufficient to discredit the conceptual construction which we are attacking. There are, however, other objections in line with the suggestion made above that science does not really deal with primary qualities as these were understood by Locke and Berkeley.

The so-called secondary qualities are thought of as sensations produced in our experience by something acting upon our sense-organs. Rightly stated, this position is, I think, beyond attack. Our thing-experiences develop under the control of the physical world; critical realism accepts this unavoidable doctrine and fits it into its theory of knowledge. But, as both Berkeley and Hume showed, and as modern psychology has doubly proved, the aspects of our thing-experiences which are thought of by Locke as somehow primary, are in the same case with the secondary. All the sensational content of our thing-experiences must be regarded as controlled by our sense-organs. Again, perceptual space is, as we have seen, a filled space; we perceive colored surfaces and tactual surfaces, never empty space. In other words, all sensations are in the same

situation and on the same genetic level. If the historical distinction between primary and secondary qualities points to a significant truth, Locke and his defenders did not state this truth properly. Science does not assume primary qualities as literal features of physical things. Only natural realism at first or second remove does this. I would call Locke's realism natural realism at second remove.

It is, unfortunately, necessary to eradicate this notion of substance completely, to destroy it root and branch, in order to prepare the mind for a correct view of our knowledge of things. We have thus far contented ourselves with showing that the construction of substance and attributes results from a misinterpretation of empirical experience. The object of our apprehension and the subject of our perceptual judgments is the concrete thing. Our judgments enlarge the content of that which is apprehended. Such analytic judgments are at the same time synthetic. Hence, the subject is not diminished to a formal entity or abstract point of reference, but enlarged with each judgment. But we must now point out that this Lockean construction not only reflects a poor logic, because it looks at everything from the standpoint of associational psychology, but leads to all sorts of metaphysical absurdities which complete its overthrow.

If it is not enough to indicate the ambiguous position of the qualities which have one foot in the substance and one foot in the mind, let us call attention to the unintelligible status of the relation between the accidents and the substance. Since the substance is distinct from the accidents, these accidents can not be thought of as expressing its nature; otherwise, we would have an infinite regress, for the nature of the substance must itself consist of accidents and these would require a substance and so on indefinitely. Hence, we are confronted by a dilemma: if the substance has a nature it must consist of accidents which are unknowable and we are landed in a complete agnosticism; if the substance has not a nature, it becomes a mere nothing and we have no right even to postulate its existence. There can be no doubt, therefore, that the construction is not only untrue to experience, but also absolutely unintelligible. Any realism which wishes to withstand the attacks of idealism must shun this form; it must learn a lesson from Berkeley's criticism of Locke.

Having run this false type of realism to earth, we can now return with thorough satisfaction to the development of other possibilities. The thing of common sense is, then, a thing-experience dominantly perceptual in character; it exists only in the field of some individual's experience and contains no peculiar core or substratum. But this thing-experience which is apprehended within experience corresponds to a definite portion of the physical world which exists out-

side of experience. Such is the position of critical realism. In science, then, we try to gain knowledge of that portion of the physical word in all the ways that are open to us. By superposition, we determine its size in terms of some standard unit; in an analogous manner we discover its mass as a ratio with another unit; we seek also to measure its free energy, to decide how it reacts to certain processes like light-waves, to learn its chemical properties, etc. But these judgments are now thought of as referring to the physical thing and not to the perceptual thing. We are, in other words, at a different genetic level, a level reached by the scientist almost unconsciously by the pressure of his facts and his technique. The scientist has passed beyond perception, yet, as a rule, he retains the thing-experience of the perceptual level as a means of reference. It is the necessity of distinguishing precisely between the thing-experience and the physical thing that the thinker must recognize. Let us now examine the result of such a distinction for our problem.

The scientist discovers certain facts *about* things; these facts are stated in the form of propositions which claim to give knowledge of things as existences apart from our experience. In truth, so soon as we leave common sense with its immediate apprehension and commence to analyze the sort of knowledge which science does achieve, we are struck by the peculiar character of that knowledge. All quantitative knowledge is in terms of ratios, for instance; but a ratio can not, obviously, be an inherent property of any one thing. Does it not follow that the knowledge science possesses will not fit into the form of natural realism? For common sense, the thing is apprehended by itself and comparison is not necessary for knowledge; the thing is red, is large, is heavy, etc. These are aspects of the thing as this is presented. But scientific knowledge is not of this character; it involves a judgment founded on a technique of comparison in which the quantity of a thing is determined in terms of some standard unit. And this ratio is not determined by perception, but by superposition. Perception is merely an instrument to confirm the results of the superposition. Now the other properties of things are likewise statements about the thing in terms of what it does to processes like light-waves, to organisms like ourselves, to chemical substances, and so on. The majority of properties are statements of empirical laws in which the particular thing is a constant factor. But such empirical laws can not be the properties of a thing as properties are conceived on the pre-scientific level; they can not be assigned to one thing in isolation from other things. They are not apprehended features of the physical thing, since this can never be apprehended. It also goes without saying that such empirical laws can not inhere in the scholastic sense in any one sub-

stance. Locke's conceptual form betrays its origin in the view that knowledge is an apprehension of a thing; it is, therefore, unadapted to the kind of knowledge that science actually gives.

We saw that Locke's construction at the perceptual level could be best undermined by descriptive empiricism and by a study of the actual logic of attributive judgments. A similar method will give us the proper clue at the scientific level of knowledge. Scientific knowledge consists of judgments which are both analytic and synthetic—analytic so far as they concern different data, synthetic so far as these are organized together by the mind as all giving knowledge of the *same* thing. No more here than in the case of the apprehension of thing-experiences is there the slightest reason for the assumption of a substance in which properties inhere.

What, then, are properties? Is it right to retain this term when its correlative, substance, has been so completely discredited? It is certainly a vague term which is apt to be ambiguous because of its origin in the standpoint of natural realism with its presentative or apprehensional view of knowledge and its historical association with the substance-accident contrast. The majority of the properties of things are statements of what the thing does under certain conditions which are supposedly reproducible. The behavior of things, their reactions, are known in empirical laws such as those of physics and chemistry and biology and supposedly known more fully and deeply in explanatory laws and theories. This behavior rests on the nature of the thing as well as on the total conditions and is so far an index of this nature. But this nature must not be thought of as divisible into entities to be called properties which are somehow possessed by the thing. The far greater number of properties are really nothing more than what Locke called "powers" and the word, power, like that of capacity, is but the expression of our belief that a thing will react in a definite way under definite conditions, and that this reaction is the expression of its nature. We should say a thing has *such a nature that* it does so and so under such and such conditions. The very form of this statement declares that we gain knowledge of the nature of the thing, or, to put it more simply, knowledge of the thing. So long, then, as the category of property can be interpreted in accordance with this form, there can be no objections to it. Unfortunately, however, only the critical thinker interprets it in this fashion. Yet science never presents us with literal aspects of the physical world, aspects which can be intuited or somehow copied in ideas. The habits and prejudices due to natural realism have prevented philosophy from understanding scientific knowledge.

But a distinction must be made at this point. There are certain classes of judgments which we can always make about things. A

thing always has mass, although it is not always chemically active; it always has size, although it is not always optically active; it always has position, although it may not be moving in relation to its surroundings; it always has some structure, although it may not be doing work. Certain classes of judgments are, then, always applicable to things and these are not thought of as giving knowledge of the "powers" of things. We shall understand this distinction better, however, when we come to study causality. At present all we need to point out is that certain categories are always applicable to things, while others are not. Things are always extended, massive, structural, but not always moving or acting in certain ways. Yet the capacity to react in certain ways under certain conditions rests on the nature of things and thus involves more than a mere possibility.

To summarize: physical things in contradistinction to thing-experiences exist outside of experience, *i. e.*, they are not objects present to what common sense calls perception and naïve realism, intuition or apprehension. These physical things are known by means of propositions which claim to give knowledge of them. These propositions fall into natural classes differentiated by the fundamental concept characteristic of each, these concepts being called the categories by the philosopher. Thus things are known in terms of certain definite concepts which are regarded as valid of the physical world in the sense that they are the essential framework of the tested knowledge which we build up in experience. Specific propositions give knowledge of physical things, but this knowledge must not be interpreted in terms of the distinction between substance and its accidents which is a false form or category nowhere justified by experience and actually resulting from bad logic, bad psychology, and bad theory of knowledge. This conclusion we have further validated by showing that the only change involved in the passage from natural realism to critical realism is the adoption of the non-presentative view of knowledge for the presentative or intuitional characteristic of natural realism and of the theories of knowledge developed under its influence. The essential realistic attitude of common sense can be retained. We have *knowledge of* physical things, a knowledge consisting of propositions having the same reference, while we have empirical objects, sensible things, thing-experiences present to the attention within the individual's experience.

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## REVIEWS AND ABSTRACTS OF LITERATURE

*L'Année Psychologigue.* Fondée par ALFRED BINET. Publiée par HENRI PIÉRON. 19th year. Paris: Masson et Cie. 1913. Pp. 515.

The new editor, in a brief preface, pays a tribute to the memory of the founder, and restates the purpose of the Année, which will contain, as in the past, original works, especially those from the psychological laboratory of the Sorbonne, and analyses and critical reviews of the literature. The editor contributes two of the original articles, and nearly two hundred of the reviews.

Piéron's first article is a general survey of the "Le domaine psychologique" (pp. 1–26), in which he treats, rather sketchily, but judiciously, of the present state and prospects of psychology on its various sides. His reaction to the "behavior psychology" is interesting. He readily accepts the definition of psychology as the science of behavior, and holds that it is an objective science. Nevertheless he is not disposed to reject the introspective method, and does not believe that the use of this method is antagonistic to the objectivity of the science. He says: "There is a certain trait in human behavior, revealed by aid of language, which consists in being interested in mental functions and in observing them while they are functioning. . . . It is quite probable that introspection presupposes the existence of consciousness in the individual who devotes himself to it; but, for the psychologist who collects introspective reports, they have the same objectivity as meteorological documents, though the recording instruments may not be equally trustworthy." The generalizations of modern introspective psychology are based on a plurality of objective documents, and no longer on the mere subjective impressions of the psychologist. But, he adds, "introspection is not a universal necessity, and, above all, it is not necessary in order to comprehend what is studied by other methods. The assertion is often made that one could not make experiments on memory unless one knew from internal experience what memory was. Nothing is more false: one can study auditory images without possessing such images, or colored hearing without being able to understand what the 'color of a vowel' can mean. A deaf individual can study hearing, a color-blind individual can study the color sense."

Piéron's second article, "Experimental Studies on the Phenomena of Memory" (pp. 91–193), brings together results from two quite different sources—verbal memory in man, and adaptation to a repeated sensory stimulus in invertebrates—and finds so many correspondences as to indicate that the process is fundamentally the same in the two cases.

The experiments on man consisted mostly in the learning of "letter-squares" composed of 25, 50, or 72 numbers. The animal experiments were done with gastropods, which react to a sudden darkening of the aquarium by withdrawing into their shells, but cease to make this protective reaction after the stimulus has been repeated several times at short intervals. Experiments were made on (1) the effect of distributed learn-

ing; (2) on the curve of acquisition; and (3) on the curve of forgetting. Under the first head, there is introduced a valuable variant of a well-known experiment of Jost. Instead of keeping the interval between learning periods constant, while varying the duration of the learning periods, he keeps the duration of the learning period constant and varies the interval between them. Thus, with human subjects, a square of numbers was read once at each learning period, and the free interval between learning periods was varied, in different experiments, from 30 seconds to 48 hours. Intervals of one half to two minutes were distinctly less favorable than longer intervals; and five minutes seemed to be slightly less favorable than ten. From 10 minutes to 24 hours, the change was very slight, while 48 hours was perhaps slightly less favorable. There is, accordingly, an optimum interval, though it is not sharply limited. Piéron interprets this result in terms of the familiar theory of the ripening or consolidation of associations.

The question of an optimum interval was also asked in experiments on gastropods, in the following form: How many stimuli (darkenings of the aquarium) must be presented at a given interval, in order that the resulting adaptation shall last a defined time (as 10 seconds) after the cessation of the stimuli? There was an optimum interval, though it was much shorter (less than a minute) than in human learning.

In his studies of the curve of acquisition, Piéron is particularly interested in examining whether, as asserted by Charles Henry, this curve is essentially different according as a memory or a habit is being acquired. By comparing the learning of a list of numbers with the practise curve in stenography and typewriting, he comes to the conclusion that there is no clearly marked difference.

In studying the curve of forgetting, he points out a peculiar condition of the well-known experiments of Ebbinghaus, namely, that the subject learned several series of syllables in immediate succession, and thus hastened the process of forgetting. In some experiments of his own, Piéron had only one series learned at a time, and tested its retention after an interval in which no other memorizing had been done. He thus gets a much slower loss of memory, and, in fact, he gets a curve of forgetting which, while having the general character of the Ebbinghaus curve, requires a somewhat different equation. This curve and equation he also finds applicable to the disappearance of the adaptation effect in gastropods, though the absolute rate of forgetting is much more rapid with them.

Finally, the author considers the striking similarity between the curve of the development and evanescence of a sensation and the curve of formation and disappearence of a memory trace, and reaches the conclusion that the two processes, though running a similar course, are distinct. The curve of sensation runs a very rapid course, and has already come down to zero before the upward sweep of formation of an association has reached its maximum. Consequently, the memory trace can not be interpreted as a residue of sensation. What is called "primary memory," or the "memory after image," is, however, a sensorial persistence, to be distinguished from memory proper.

There are two other papers on memory. Heymans discusses the "two memories of Bergson" (pp. 66–74), the one active, motor, and at bottom physical, the other passive, imaginal, and purely spiritual. The former is exemplified by remembering a lesson which has been learned by several repetitions; it is identical with habit. The latter is exemplified by the revival of a momentary experience, as of a single one of the readings by which the lesson was learned. Heymans does not accept this distinction, but holds that what remains in the remembered lesson, after several readings, is what is common to these several experiences, what is dissimilar having disappeared by mutual inhibition. "In fine, it appears to me that the memory image is nothing but a nascent habit, and a habit nothing but the memory image fixed by repetition, and isolated from its changing circumstances."

Foucault studies the influence of the length of a series of words to be learned on the time of learning and on retention (pp. 218–235). He is here working on familiar ground, in the hope of fixing the relations more precisely than has been done hitherto. He finds the following law closely followed by his own results and by others in the literature: the time for continuous learning increases as the square of the number of words in the series. Time is here a representative of work. The law breaks down for very short series, where memory proper does not come into play, and for series so long as to bring on fatigue before they are learned. In regard to retention, it has long been known that a longer series is retained better than a short, when each is learned just to the point of correct recitation. His results on this point, not very extensive, to be sure, can be formulated by saying that the proportion forgotten is inversely proportional to the length of the list.

The author of this paper makes some interesting remarks regarding the attitude which should be taken towards such mathematical formulations of facts. He rejects the attitude now in vogue of regarding them as mere empirical approximations, and holds that the slight divergences that are sure to appear between observed and calculated values are due to the complication of conditions, and not to any fundamental incapacity of mathematical thought to get to the bottom of things. If the latter were the case, it would, he believes, be impossible to explain how mathematical formulæ can prove to be approximately correct.

Foucault also contributes an article on "The most general laws of mental activity" (pp. 75–90). He first raises the question of the measurability of mental work. To be measured a magnitude must be homogeneous and continuous, conditions which are at first thought not realized in mental performances. But the condition of homogeneity can be met by providing suitable material for work, as has been accomplished notably in memory experiments; and the rhythmic regularity of work in performing a series of similar tasks is a satisfactory substitute for continuity. Accordingly, mental work can be measured under experimental conditions. The first law of mental work is that when it is directed to a constant end, and performed under constant conditions, the time consumed can be taken as a measure of the work. The validity of this measure is

indicated by the approximate constancy of the time required to accomplish the same task. Some variation, however, always remains, and the second and third laws are concerned with the variability of time in the repeated performance of the same or equivalent tasks. The variability increases with the intellectuality or "quality" of the work, and decreases, relatively and very slightly, with the quantity.

Boquet writes on "The investigations of astronomers on the decimal equation" (pp. 27–65). The decimal equation is akin to the personal equation, and was first noticed by the astronomers Hartmann and Pierce. When the fraction of the unit of a scale has to be estimated in tenths, the several tenths are not recorded with equal frequency, as they should be in the long run, but in certain proportions which are characteristic of the individual observer. The following table gives the frequency per thousand observations of the records for each tenth by three astronomical observers:

| Tenths | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1st observer | 113 | 105 | 193 | 111 | 36 | 44 | 29 | 58 | 185 | 125 |
| 2d observer | 250 | 77 | 103 | 61 | 114 | 85 | 47 | 74 | 95 | 94 |
| 3d observer | 169 | 78 | 132 | 81 | 50 | 58 | 57 | 113 | 141 | 121 |

The observers differ considerably, but each observer is found to give nearly the same proportions in different sets of 1,000 observations. The decimal equation appears in various sorts of measurement, and a similar phenomenon appears when the division is into fifths instead of tenths. There are also individual peculiarities or "equations" in bisecting a line or space. A genuine psychological explanation has not been reached, but the formulation of Pierce still seems to fit the facts; according to this, the observer makes use in all such estimations of a "personal scale" which is more or less distorted.

Rabaud gives experimental and statistical evidence against the existence of an "Instinct of Isolation in Insects" (pp. 194–217). It is true that in a single ripe nut or acorn no more than a single larva is usually found, but this isolation does not result from any instinct on the mother's part to avoid nuts in which an egg has already been laid. In some cases, the small number of females as compared with the number of nuts makes it improbable that more than one egg shall get deposited in the same nut, and a count shows that the number of nuts receiving two eggs is about what is demanded by probability. In other cases, where the number of females is comparatively large, it frequently happens that more than one egg is deposited in the same nut, and more than one larva develops, each one at first being enclosed in a cavity of its own making. As these cavities become larger and coalesce, the two larvæ proceed to fight, until one is driven out or killed. In these cases the isolation is secondary. The fighting instinct which results in this secondary isolation can hardly be regarded as directed towards isolation, since it occurs also in species other than endoparasites.

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*Nietzsches Gefühlslehre.* HANS SCHAFFGANZ. Leipzig: Felix Meiner. 1913. Pp. viii + 133.

The main purpose of this monograph is to show that Nietzsche's philosophy is derived from a single psychical principle, namely, *Gefühl.* By this means the author hopes also to exhibit the unitary character of the development of Nietzsche's thought in all the three periods, and the essential originality of his doctrine. In the first period, in spite of the powerful appeal that Schopenhauer made to him, Herr Schaffganz thinks it is clear that Nietzsche's fundamental principle is feeling rather than will. The argument by which he seeks to show this is not altogether convincing. It is based partly upon his conception of the Dionysian tendency in the *Geburt der Tragödie* and partly upon his interpretation of various discussions of esthetic problems in the *Nachlass* of this period. As to the former, even if Nietzsche held that the Dionysian tendency penetrates the inner nature of the absolute (p. 11), it still remains to be proved that this tendency is to be identified with feeling rather than will. And as to the evidence of the *Nachlass,* Herr Schaffganz seems to overlook the fact that it contains various indications that at this time Nietzsche follows Schopenhauer in conceiving ultimate reality as will.

In the second period Nietzsche frees himself from the metaphysical tendencies of his earlier thought and limits himself to psychological investigation. Instead of inquiring as to the essence of *Gefühl*—which, as the absolute, must be unknowable—he now considers it purely as psychical activity and attempts an analysis of its various functions. He designates *Empfindung* as the fundamental function and seeks to derive all the others from it. Although this period is devoted chiefly to psychological investigation, Nietzsche seems to have been little influenced by the contemporary literature of the science, and his method is very different from that of professional psychologists. His results are gained more often by an "*einzigartige Kunst,*" by "*intuitive Erkenntnis des eigenen Seelenlebens,*" than by the strict method of modern psychology. We see in him a conflict between two tendencies, the one inclining him to the use of exact psychological methods and the other driving him beyond the boundaries of empirical investigation.

In the third period Nietzsche for the first time becomes definitely conscious of his *Gefühlsproblem.* In consequence, his opposition to scientific psychology increases, so that he finally altogether denies the possibility of accurate self-observation. His cutting loose from empirical psychology removes a disturbing influence in the development of his *Gefühlslehre* and permits his "intuitive self-perception" to work freely. It now becomes still more obvious that he finds the confirmation of all his hypotheses in his own inner life. He constantly emphasizes the physical basis of this inner life, but never succeeds in harmonizing his biological theories with the results of his self-perception. The third period, with its abandonment of empirical psychology, marks the return to metaphysics—a metaphysics, however, which, like that of the first period, is psychological in character. A comparison of the three periods exhibits them as stages in the develop-

ment of a unitary thought. In the first, *Gefühl* is by implication identified with the absolute, but Nietzsche does not try to determine its inner nature. The second period gives us no deeper insight into the essence of feeling, but is occupied with an analysis of the feeling-functions. In the third, an attempt is made to determine the essence of *Gefühl,* and on the basis of his personal experiences Nietzsche characterizes it as *der Wille zur Macht,* which he designates as *das Ungewordene* that forms the ground of all becoming (p. 77). This designation seems to imply an identification of *Wille zur Macht* with the absolute, and Herr Schaffganz maintains that through it Nietzsche has gained a new insight into the nature of ultimate reality (pp. 77 ff.). None the less he insists that the *Wille zur Macht* has little relation to Schopenhauer's will (pp. 2 ff.) and that it is regarded by Nietzsche, not as independent, but as a function of *Gefühl.* In his attempt to defend the latter statement (pp. 121 ff.) it seems to me that he fails to distinguish between will as developed, clearly conscious volition, which obviously is complex and obviously rests upon feeling, and the *Wille zur Macht,* which, whatever its nature, is something quite different. Whether *Gefühl* or *Wille zur Macht* is primary, it is evident that they are closely related, and it is probable that Nietzsche himself did not sharply differentiate them. But in any event the *Wille zur Macht* seems to me an aspect of Nietzsche's philosophy in which it approaches closely to Schopenhauer's; and to deny the influence of Schopenhauer here is to misinterpret Nietzsche. If Herr Schaffganz wished to exhibit Nietzsche's originality he would have done better by distinguishing between *Wille zur Macht* and *Wille zum Leben* and by dwelling upon the unique character of Nietzsche's ethics.

The author makes little attempt at criticism of Nietzsche's doctrine. His purpose is exposition, and he has given us a sympathetic and interesting study. He seems to me, however, somewhat too anxious to exhibit Nietzsche as a systematic philosopher with clearly defined metaphysical doctrines.

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## JOURNALS AND NEW BOOKS

MIND. January, 1915. *The Rise and Fall of the Platonic Kallipolis* (pp. 1–15): F. V. MERRIMAN. – The rise is determined teleologically, the decline by efficient causality. Why this difference in treatment? Viewed as organization the two types of city are too alike, so much alike that Euripides praised tyranny and Plato tried to build one upon the other in Sicily. Evil does obtain a certain success if it follow principles of organization neither good nor bad, but efficient. *Mr. Russell and Some Recent Criticisms of His Views* (pp. 16–28): OLIVER STRACHEY. – A criticism of three articles in *Mind* for April, 1914, dealing with some of Mr. Russell's opinions. *Where do Perceived Objects Exist?* (pp. 29–36): DURANT DRAKE. – Perceived objects are as real as real-objects; but they are not

those particular real-objects which they represent. They exist in the brain, not the perceived brain, but the real brain. This position may be called representative realism. *The Vedantic Good* (pp. 37–59): P. NARASIMHAM.—Vedantic ethic trains man toward a clearer apprehension of unity by asking him to act as if he really experienced unity. The ideal is one of divine solidarity of the world-life as a fact of one's immediate consciousness, the recognition of which places one beyond good and evil. *Discussions: Analysis of Categorical Propositions* (pp. 60–64): E. E. C. JONES. *Dr. Alexander on Mind and Its Objects* (pp. 65–69): J. E. TURNER. *The Limits of Logical Validity* (pp. 70–74): E. MAYO. *The Opponents of Formal Logic* (pp. 75–79): H. S. SHELTON. *The Classification of Terms* (pp. 80–85): C. A. MERCIER. *Critical Notes:* R. Eucken, *Main Currents of Modern Thought:* R. F. A. HOERNLÉ. F. Enriques, *Problems of Science:* C. D. BROAD. A. Sidgwick, *Elementary Logic:* H. V. KNOX. E. Hammacher, *Hauptfragen der modernen Kultur:* B. BOSANQUET. Prof. Aliotta, *The Idealistic Reaction against Science:* C. D. BROAD. E. Juvalta, *Il Vecchio e Il Nuovo Probleme della Morale:* A. W. BENN. *New Books. Philosophical Periodicals. Notes and News.—Mind Association: Full List of Officers and Members.*

Mackenzie, W. Significato Bio-Filosofica della Guerra. Genova: A. F. Formiggini. 1915. Pp. 101.

Rai, Lajpat. The Arya Samaj: An Account of its Aims, Doctrine, and Activities with a Biographical Sketch of the Founder. New York and London: Longmans, Green, and Company. 1915. Pp. xxvi + 305. $1.75.

Whitstock, Otto M. Manual of the Simplified Shorthand. New York: Standard Shorthand Academy. 1915. Pp. 72. $2.00.

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## NOTES AND NEWS

THE Nicholas Murray Butler medals were awarded for the first time at the Columbia University Commencement on June 2. A medal in gold is awarded every five years for the most distinguished contribution made during the preceding five-year period, anywhere in the world, to philosophy or to educational theory, practise, or administration. A medal in silver or bronze is awarded annually to that graduate of Columbia University in any of its parts who has during the year preceding shown the most competence in philosophy or in educational theory, practise, or administration. The gold medal was awarded to the Hon. Bertrand Russell, lecturer and late fellow of Trinity College, Cambridge. The silver medal was awarded to Dr. Ellwood Patterson Cubberly, professor of education, Leland Stanford Junior University. We print the following from the report of the Committee appointed by President Butler to recommend to the Trustees of Columbia University names of persons from whom, in the Committee's opinion, the choice should be made for the conferring of the medals:

"In making recommendations for the award of the Gold Medal the

Committee found themselves considerably embarrassed in attempting to decide questions of the relative importance of contributions, and particularly the question of the most distinguished contribution to philosophy or education anywhere in the world during the last five years. They feel that their recommendations will be less open to criticism and objection if they are regarded as based upon a recognition of contributions which have won throughout the world the distinction of shaping and controlling the dominant philosophical or educational interest during the period named. Guided by this consideration, the Committee were of the opinion that such contributions are to be found principally in philosophy, and so make no recommendations in the field of education. They were also of the opinion that the type of logical studies represented in the work of the Hon. Bertrand Russell have been the distinctively determining philosophical interest during the period under consideration. Other philosophical interests have, in their opinion, taken a less distinctive place and have been more relevant to philosophical discussion of the preceding decade. Mr. Russell in his collaboration with Professor Whitehead in the 'Principia Mathematica,' now in its third volume, in his 'Problems of Philosophy,' in his 'Knowledge of the External World,' and in his articles in the *Monist,* has made a contribution to philosophical discussion which for originality and force is, we believe, generally recognized as entitling his work to first consideration.

"The Committee were of the opinion that the work of Professor Ellwood Patterson Cubberly so far surpassed during the current year that of any other graduate of Columbia in the field of philosophy or education that it was needless to recommend any other graduate for the award of the Silver or Bronze Medal. His work entitled, 'State and County Educational Reorganization—the revised constitution and school code of the state of Osceola,' is a constructive application of the principles and facts of state and county school administration as expressed in the revision of the article on education of the constitution, and the revised school code which follows it, for the hypothetical state of Osceola. It is a synthetic effort to apply the varied results of administrative experience with public education in the United States to a single plan of reorganization."

PROFESSOR J. MARK BALDWIN, honorary professor of the University of Mexico, formerly professor of philosophy and psychology in the Johns Hopkins University of Baltimore, has been appointed Herbert Spencer lecturer for the year 1915–16.

ON the occasion of the inauguration of Dr. Frank H. Goodnow as president of Johns Hopkins University the honorary degree of Doctor of Laws was conferred upon Dr. John Dewey, professor of philosophy in Columbia University.

PROFESSOR R. C. LODGE, who has been this year at the University of Minnesota, has been appointed professor of philosophy and psychology at the University of Alberta.

DR. HENRY SUZALLO, professor of the philosophy of education in Teachers College, Columbia University, has been elected president of the University of Washington.